

Application No. 10/506,854  
Amendment After Final dated July 28, 2008  
Reply to final Office Action of February 26, 2008

### **REMARKS**

Applicants submit, contemporaneously herewith, a Request for Continued Examination pursuant to 37 C.F.R. §1.114.

Claims 1-14 are pending in the application. No claims have been allowed.

### **Claim Rejections - 35 U.S.C. § 103**

Claims 1-11 and 14 have been rejected under 35 U.S.C. § 103(a) as unpatentable over Murakami et al. (U.S. Patent No. 6,550,567) in view of Fleytman (U.S. Patent No. 6,098,480).

Murakami et al. discloses a worm gear for a vehicle steering system. Applicants agree with the Examiner's indication that Murakami et al. does not disclose that the worm wheel has teeth that have different pressure angles on the left and right side so that the normal force between the worm and the worm wheel is independent of the direction of rotation of a torque exerted on the worm by the worm wheel.

Fleytman discloses a worm gear assembly for a drive axle of a vehicle, with the teeth of the worm gear having a tooth profile with two pressure angles, one on each side of the tooth. Fleytman provides this arrangement to present a worm gear assembly which has improved efficiency and component life, is quieter, has a higher torque handling capacity and improved weight savings. As indicated above, Applicants have reviewed Fleytman and find no reference that the different pressure angles on opposing tooth flanks differ so that the normal force between the worm and the worm wheel is independent of the direction of rotation of a torque exerted on the worm by the worm wheel as called for in Applicants Independent Claim 1.

In Paragraph 1 of Page 4 of the current office action, the Examiner indicates that Fleytman discloses a gear having teeth that have different pressure angles on the left and right "so that the normal force between said worm and said worm wheel is independent of the direction of rotation of the torque exerted on said worm by said worm wheel." Applicants have reviewed Fleytman and find no indication in this reference that the different pressure angles disclosed therein function to provide a normal force between the worm and the worm wheel that is independent of the direction of rotation of the torque exerted on the worm by the worm wheel as called for in Applicants Independent Claim 1.

Specifically, the only relevant disclosure in Fleytman indicates that the tooth profile of the worm gear includes drive side 42 and coast side 44 and further indicates that "typically, the drive side 42 of the gear tooth 34 receives loading while the coast side 44 does not." U.S. Patent No. 6,098,480, column 3, lines 6-8. Applicants have disclosed and claimed a worm gear for a vehicle steering system wherein the worm gear is adapted to be bidirectionally driven. Fleytman discloses a worm gear for a drive axle which functions almost exclusively in a single direction of rotation, hence the above-cited indication of a drive side and a coast side of the worm gear teeth. By designing asymmetrical tooth surfaces on the drive and coast sides of each tooth, Fleytman is able to increase the durability of the worm gear assembly for a drive axle. Because the coast side of the worm gear teeth of Fleytman typically does not have to withstand loads, the coast flank can have a different geometry from the drive flank.

Moreover, while Fleytman discloses asymmetrical tooth surfaces on the drive and coast sides of each tooth, nowhere does Fleytman disclose the different pressure angles on opposing tooth flanks differ so that the normal force between the worm and the worm wheel is independent of the direction of rotation of a torque exerted on the worm by the worm wheel as called for in Applicants Independent Claim 1. Referring to paragraph [0035] of the present application, numerous factors, such as the length of lever arms  $a$ ,  $b$ ,  $c$  and the spring force  $F_{spring}$ , contribute to the resulting normal force between the worm and the worm wheel. Nowhere does Fleytman disclosure manipulating these factors and/or the pressure angles on opposing tooth flanks so that the different pressure angles on opposing tooth flanks achieve a normal force between the worm and the worm wheel that is independent of the direction of rotation of a torque exerted on the worm by the worm wheel.

Applicants Claim 1 calls for asymmetric tooth flanks on the left and right sides of each tooth of a worm wheel so that the normal force between the worm and the worm wheel is independent of the direction of rotation of a torque exerted on the worm by the worm wheel. Fleytman does not disclose or suggest such structure and, therefore, Applicants respectfully submit that even assuming arguendo that Fleytman can properly be combined with Murakami et

al., that Applicants Independent Claim 1 and Claims 2-11 and 14 depending therefrom are patentable over such a combination.

Claims 12 and 13 have been rejected under 35 U.S.C. § 103(a) as unpatentable over Murakami in view of Fleytman as discussed above and further in view of Lu et al. (U.S. Patent No. 6,046,560). Applicants respectfully submit that dependant Claims 12 and 13 are patentable together with Independent Claim 1 from which they depend for at least the reasons cited above with respect to Independent Claim 1.

### **Double Patenting**

Claims 1-11 and 14 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1-20 of U.S. Patent No. 6,860,829 in view of U.S. Patent No. 6,098,480 to Fleytman. Fleytman is again cited as disclosing a worm wheel having teeth each of which has different pressure angles between the right and left flanks thereof. As argued above with respect to the 35 U.S.C. § 103(a) rejection of the pending claims in view of Fleytman, Fleytman does not disclose or suggest asymmetric tooth flanks on the left and right sides of each tooth of the worm wheel so that the normal force between the worm and the worm wheel is independent of the direction of rotation of a torque exerted on the worm by the worm wheel as called for in Applicants Independent Claim 1.

### **Conclusion**

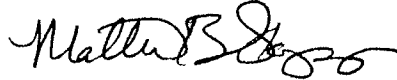
For all of the above reasons, Applicants respectfully submit that the claims, as amended, distinguish patentably over the cited references and are not obvious in view thereof.

In the event Applicants have overlooked the need for an extension of time, payment of fee, or additional payment of fee, Applicants hereby petition therefore and authorize that any charges be made to Deposit Account No. 02-0385, Baker & Daniels LLP.

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If any questions concerning this application should arise, the Examiner is encouraged to telephone the undersigned at 260/424-8000.

Respectfully submitted,



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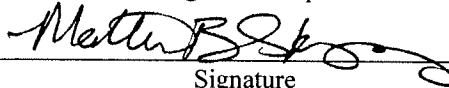
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July 28, 2008

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